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ABSTRACT

Responding to the Texas Education Agency's (TEA) "Essential Computing Competencies for Educators" (1983), the teacher's education program at Texas A&M University developed several computer literacy courses for its students. An evaluation was conducted of the first of these courses, "Microcomputer Literacy for Educators," to determine whether the course met the needs of individual students with differing entry level skills and prior experience, and whether it satisfied TEA's guidelines for computer competence. Demographic and computer experience data were collected through a survey of 23 students enrolled in the course during the summer of 1984; student performance data were obtained by matching the results of each pretest and posttest item with the appropriate areas of competencies identified by TEA. Analysis of the data indicated that: (1) students who had not had any previous experience with computers improved their scores from the pretest to the posttest; (2) entering students scored relatively high (an average of 3.7 out of 5) on the attitude assessment section of the pretest, but scored only slightly higher (4.3) on the posttest; and (3) students who reported being able to type 50 words/minute or better did not show a substantial improvement in scores from the pretest to the posttest. It was concluded that although the course did include all of the computer competencies that TEA had outlined it did not appear to have made a difference in key programming skills. Four conclusions and recommendations are included as well as two references. (JB)

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Title: Developing Computer Literacy : What are We Actually Teaching Preservice Teachers?

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Intended Audience: College teachers who are currently involved in the development or evaluation of computer literacy courses for preservice teachers.

Problem Statement: Responding to Texas Education Agency's "Essential Computing Competencies for Educators" (1983), the teachers education program at Texas A&M University has recently developed several computer literacy courses as part of the College's Educational Technology Program. The first of these courses,, "Microcomputer Literacy for Educators", was specifically designed to satisfy those guidelines for computer competencies as stated by the Texas Education Agency (TEA). The course was first implemented in the summer of 1983. The following summer, July-August, 1984, a descriptive study of students' achievement in the literacy course was done. This report is a summation of that study.

The purpose of the evaluation made was to determine if the course, "Microcomputer Literacy for Educators", 1) meets the needs of individual students with regard to their entry skills and prior experiences with computers, and 2) satisfies TEA's guidelines for computer "competency".

Results and Methodologies: The computer literacy course provides students experiences through the presentation of various microcomputer systems and microcomputer software and through presentations of the implications and effects that those systems have on education. The presentations are then complemented by activities that allow students to use and evaluate microcomputer hardware and software. All of this takes place in a computer laboratory that has sixteen Apple IIe workstations and a small educational software library.

A survey was given to the twenty-three students enrolled in the 1984 second summer session. Demographic information collected from the survey included: students' school classification; the size of their hometown (population); whether or not they have had any prior experiences with computers; and, the students' typing speed.

The instrument used for the pretest and the posttest was a forty-two question, condensed version of the Minnesota computer Literacy and Awareness Assessment (MCLAA, 1980). The instrument consisted of twelve items taken from the Affective Assessment section of the MCLAA and thirty items taken from the Cognitive Test section of the MCLAA. Each item on the pretest and posttest was matched with appropriate areas of competencies identified by TEA. Questions on the Cognitive Test used either a multiple choice or a true-false format. Test items used from the Affective Assessment section asked the students whether they agreed or disagreed with the statement given. These test items were recorded as follows: a response identifying a positive attitude was assigned a value of five, and a response identifying a negative attitude was assigned a

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value of one. Table 1 shows a list of the computer competencies, as stated by TEA, and the test items that were used to assess those competencies.

TABLE 1

TEA Computer Competencies	MCLAA Test Item Numbers
Attitudes	
free of fear, anxiety and intimidations from computer experiences	1,3,5,8,9,10
confidence and satisfaction when using computers	11 & 14
supportive of the implementation of computer education	16,17,18,19
Applications	
identify applications of computers in society	31,32,35,53,58
identify limitations, considerations in using computers	51 & 61
Software and Data Processing	
recognize that computers get instructions to either store or process information from a program that has been written in a computer language	62,63,73,75,78,79
Hardware	
identify, describe, and demonstrate the function and operation of various components of a computer system	42,47,50,52,66,68, 69,72
Programming	
demonstrate ability to read, write, and/or modify simple programs using problem solving techniques, i.e. interpret, modify, or develop algorithms that can be used to explain the program or solve the problem	65,70,74,77,82,83
Impact	
identify various ways in which computers have had an affect on society	41,45,57

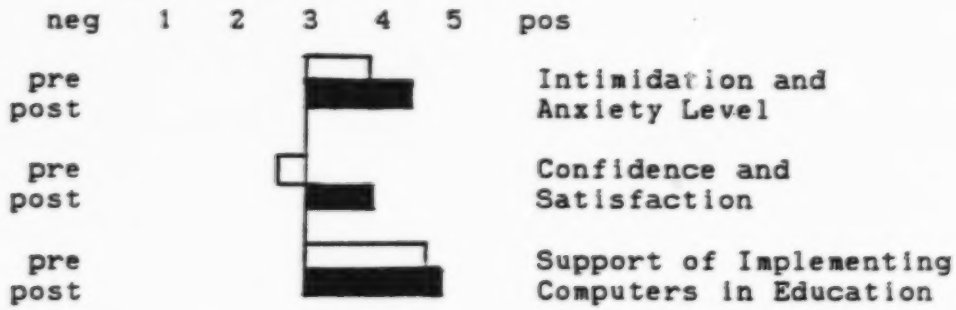
Examination of the course showed that the questions were relevant to the course and the content measured by each of the questions was addressed during at least one of the lesson units of the course. Questions in the attitude section were grouped into three different subcategories (see Attitude in Table 1) each of which were analyzed separately. Average scores were recorded for each subcategory in the attitude section. Scores for the other five categories were converted to percentages and then averaged together to yield a final composite score.

The raw scores were placed into a Lotus 1-2-3 worksheet file. Lotus 1-2-3 is a microcomputer-based software package that includes spreadsheet functions and was used to record the data and make comparisons on the composite scores. In addition, STATPRO, a computer software used primarily for statistical analysis, was used to analyze correlations among the data that was collected.

The study showed that entering students scored relatively high (an average of 3.7 out of 5) on the attitude assessment section of the pretest, but scored only slightly higher (4.3) on the posttest. Figure 1 shows attitude pretest and posttest scores for each of the three subcategories.

Students had relatively positive attitudes upon entering the course, and at the end of the semester all three subcategory scores in the attitude section showed an increase. This information suggests that students who were unsure of their position, in regards to the attitude questions, at the beginning of the semester had developed relatively positive attitudes by the end of the semester.

Figure 1



The data were analyzed to study the relationships between student's entry skill and experience with computers (see above) and performance in the course (measured by a posttest and performance on class activities). Those items for which a moderate to strong relationship (r >= .45) existed are listed (in order of decreasing r) in table 2. All substantial correlations were found to be positive in direction and not stronger than .60.

Table 2

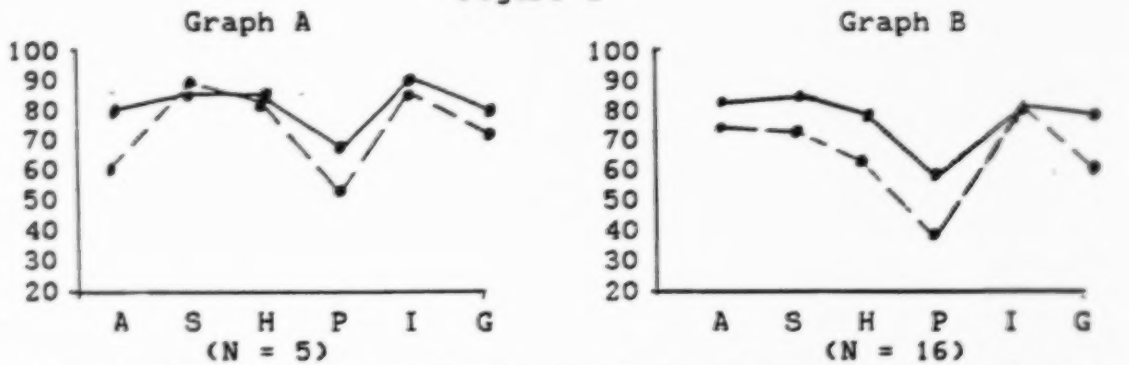
Data for which correlation exceeded .45		r
1. Confidence/posttest	Final exam grade	.60
2. Typing skills	Confidence/posttest	.57
3. Typing skills	Software/posttest	.57
4. Support for computers in education/pretest	Hardware/posttest	.56
5. Application/pretest	Hardware/posttest	.55
6. Support for computers in education/pretest	Application/posttest	.53
7. Typing skills	Software/pretest	.47

The fact that a moderately strong, positive correlation existed between student's typing skills and the areas of software and confidence on the posttest, but not between typing skills and students' final grades indicates that typing skills did not result in behavior or experiences which transferred to a better overall experience with course objectives. This seems to be true in spite of the fact that students with better typing skills would have had opportunity (in a given class or laboratory period) to interact with more software and the fact that each interaction would seem to

have been more productive than if no typing skills existed. Unless more sophisticated analysis is done (e.g. multiple regression), however, accurate interpretation of the data is impossible due to the nature of other effects. For example, a correlation of .34 was found to exist between students' typing skills and previous computer experience.

Students who reported being able to type fifty words per minute or better (Figure 2, Graph A), did not show a substantial improvement in scores from the pretest to the posttest. While those students who reported that they were beginning typists (Figure 2, Graph B) averaged a fifteen percentage point increase in scores. And, as revealed in Graph B, all of the gain occurred in areas which required typing. Though not examined, a possible hypothesis is that more attention (in activities which required typing) was required by, and therefore given to, students who were not familiar with keyboarding operations.

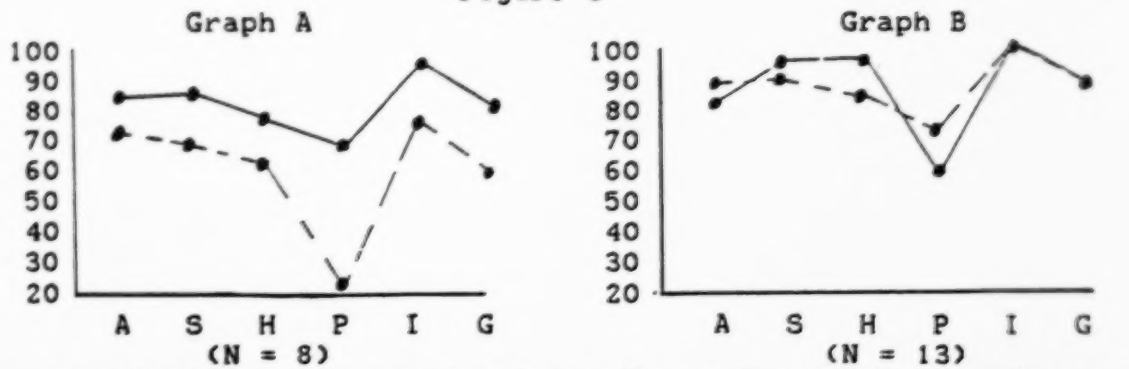
Figure 2



(----) = pretest; A = applications; S = software; H = hardware
(——) = posttest; P = programming; I = impact; G = average score

The study showed that students who have not had any previous experiences with computers improved their scores from pre to posttest. This implies that the course helped these students increase their knowledge of computers and the applications of computers (Figure 3, Graph A). Students who entered the course with computing experience, however, did not score better on the posttest than they did on the pretest (Figure 3, Graph B).

Figure 3



(----) = pretest; A = applications; S = software; H = hardware
(——) = posttest; P = programming; I = impact; G = average score

The course may not have benefitted students who were already familiar with the topics covered in the course. An alternate explanation is that the pre and posttests were not difficult enough to effectively measure changes in this group of students (ceiling effect).

The evaluation revealed that the course did include all of the computer competencies that TEA outlined in their publication (TEA, 1983). The course did not, however, appear to made a difference in key programming skills. Scores in the programming category were consistently lower (forty percent pretest and sixty percent posttest score) than scores in all other categories for the pretest and posttest. Even though one of the major projects in the course and a good deal of class time (roughly twenty percent of the course grade) pertained to modifying programs, the most frequently missed items on the posttest were 77 and 83. Both items asked students to modify an existing program: item 77 required the modification of a short program written in BASIC; item 83 required students to add a step to a flowcharted algorithm in order to add an additional function to the program.

From the analysis of the data, the following conclusions and recommendations are made:

(a) The extent to which the course has been effective for students who have had prior experience with computers cannot be ascertained by using the MCLAA, because it does not discriminate sufficiently among those students in most of the areas measured.

(b) In order to better determine the effectiveness of the course a study involving a control group (to study maturational effects or alternative curricula or methodologies) is desireable.

(c) More attention needs to be given to adjust for differing entry level typing skills and previous experiences with computers.

(d) The course appeared to be weakest in meeting the more complex programming objectives. Students demonstrated growth in knowledge of BASIC language and syntax, but did not demonstrate growth in their abilities to modify BASIC programs.

The fact that the course, as it was taught, appeared to be ineffective in teaching programming skills should be examined further. One possibility is that such skills (writing or modifying meaningful programs) cannot be taught as a small component of a literacy course. If they can't be taught, consideration should be given to either dropping the requirement from the competency lists or, if these skills continue to be considered as essential, readjusting course priorities or developing other courses to teach them more effectively.

References

Anderson, Ronald E., Krohn, Karl & Sandman, Richard (1980). User guide for the Minnesota Computer Literacy and Awareness Assessment. St. Paul, MN: Minnesota Educational Computing Consortium.

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Key Words

Computer Literacy
Course Evaluation
Teacher Education